CEVE 310
Principles of Environmental Engineering
Fall, 2016

Professor Pedro J.J. Alvarez

Lectures:	M, W, F	8:00-8:50 a.m.	201 Ryon Lab
Office Hours:	M, W, F	9:00-10:00 a.m. (section 1)	262 Mech Lab
	T	5:00-6:00 p.m. (graders)	253 Mech Lab
	Also by appointment		
Required Text:	INTRODUCTION TO ENVIRONMENTAL ENGINEERING AND SCIENCE, 3rd Ed. by Gilbert M. Masters and Wendell P. Ella. Prentice Hall, 2007.		
Grading:	3 Exams		70%
	Homework & quizzes*		15%
	Group Paper & presentation		15%

Exams are closed book. (7:00-9:00 PM). *No makeup exams without a valid medical emergency!!!*

Homework Problems are due by 4:30 p.m. on the designated day (see syllabus). Solutions will be posted on the course Canvas web site (https://idp.rice.edu/idp/profile/SAML2/Redirect/SSO?execution=e2s1) on the due date. *No credit will be given for late submissions*. You should discuss scheduling problems with us *before* the deadline to resolve potential conflicts. The HW graders will be Sammy Elliott (sje4@rice.edu) and Ellen Munday (esm3@rice.edu).

A Group Paper (teams of about three students) should review any particular phenomenon, issue, or technology of your choice related to environmental engineering and science. The paper must be typed, ten pages maximum length (double-spaced, excluding references, tables and figures), and contain references to scientific literature (i.e., journal articles). Oral presentation using PowerPoint (about 10 minutes) is required. Potential topics include environmental implications and applications of nanotechnology, emerging global challenges, sustainable infrastructure, alternative energy sources, globalization and the environment, etc. Let your imagination guide you within the boundaries of common reason. You are encouraged to consult with the Center for Written, Oral, and Visual Communication, as you begin to prepare your final presentations and reports.

Course Scope and Structure. This course will familiarize students with environmental engineering and provide a basic understanding of environmental chemistry, biology, environmental pollution and control, hazardous substances and risk analysis, fate and transport of pollutants, global atmospheric change, and pollution prevention. Part I addresses basic principles of environmental engineering, with focus on the application of material and energy balances to environmental systems, chemical equilibria and reactions important to natural systems, and kinetics of population growth and resource consumption. Part II addresses water pollution and control, with focus on common drinking water pollutants and treatment techniques, wastewater treatment processes, limnology, water quality parameters and modeling, and hazardous waste legislation and treatment. Part III addresses air pollution and control, with focus on the criteria pollutants of the Clean Air Act, atmospheric stability and meteorology, pollutant dispersion and the Gaussian Plume, the greenhouse effect, and stratospheric ozone depletion.

Ethics
All students are expected to act in an honest and ethical manner consistent with Rice University regulations and honor code.

Since some homework and exam questions could be similar to those of previous years, possessing, consulting or studying with old homeworks or exams will be considered as a serious violation of the honor code.

The consequences for acts of academic dishonesty will range from punitive grade reduction to course failure. Specifically, students should understand the definition of plagiarism. The information on plagiarism at the link below is required reading:
http://gervaseprograms.georgetown.edu/honor/system/53377.html

Course learning objectives
Students should learn to:

1. Use equilibrium relationships to predict partitioning of chemicals in natural systems.
2. Use mathematical models to predict population growth and resource consumption.
3. Derive and apply steady state and transient mass balance equations as ideal batch and continuous flow completely-mixed systems using biological or chemical information on reaction rates.
4. Design mathematical models for pollutant decay and effects in natural systems.
5. Estimate public health risks associated with exposure to carcinogens.
6. Design a computer model to assess the required BOD removal efficiency of a wastewater treatment facility to meet (dissolved oxygen) water quality guidelines downstream.
7. Use mathematical models to predict downwind concentrations of an air pollutant.
8. Use ideal reactor models to predict chemical behavior and fate in natural systems.
9. Appreciate environmental engineering impact in society.
10. Use environmental engineering knowledge to interpret current events.

Expected learning outcomes
Students completing the course should be able to demonstrate:

a) scientific & technical knowledge in environmental engineering and an ability to apply knowledge of mathematics, science, and engineering; for example, design and use mathematical models
b) an ability to analyze and interpret data
c) an ability to a system component to meet desired needs within realistic constraints such as environmental, ethical, health and safety, practicality, and sustainability
d) an ability to function on multidisciplinary teams (e.g., group project)
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively (e.g., class presentation, paper)
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues; and
k) an ability to use the techniques, skills, and modern engineering tools necessary for basic environmental engineering practice.

CEVE 310: PRINCIPLES OF ENVIRONMENTAL ENGINEERING

Syllabus FALL 2015

Date	Topic	Reading*	Homework
M, 8/22	**I. General Principles** L1. Logistics and introduction. Units of measurement. *Start hw#1: 1.2, 1.6, 1.12, 1.13, and 1.16* (50 points)	1-6	
W, 8/24	L2. Mass balances and the step function.	6-21	
F, 8/26	L3. Energy fundamentals. Environmental chemistry: stoichiometry.	21-33, 47-52	
M, 8/29	L4. Environmental chemistry: equilibrium, carbonate system. *Start hw#2: 1.23, 1.29, 1.33, 2.1, and 2.7* (50 points)	57-70	HW1 Due
W, 8/31	L5. Environmental chemistry: organic and nuclear chemistry	70-81	
F, 9/2	L6. Forecasting: growth models and resource consumption. *Start hw#3: 2.6, 2.17, 2.21, 2.27, 2.34(b,c,f,g,h), & 2.36* (60 pts)	87-106	
M, 9/5	*Labor day (NO CLASS)*		HW 2 Due (T 9/8)
W, 9/7 Dr. Adamson	L7. Population forecasting. *Start hw#4: 3.5, 3.6, 3.10, 3.12, 3.14, and .3.20* (60 points)	106-120	
F, 9/9 Dr. Adamson	Review	173-181	HW3 Due
M, 9/12	**II. Water Pollution and Control** L8. Water resources.	s	HW4 Due (T, 9/15)
W, 9/14	L9. Common water pollutants. **EXAM 1 (Chapters 1-3) 7-9PM @ Keck Hall 100**	181-199	
F, 9/16	L10. Surface water quality: BOD. *Start hw#5: 5.8, 5.16, 5.21, 5.30, and 5.37* (50 points)	199-209	
M, 9/19	L11. Surface water quality: O_2 depletion in rivers.	210-229	
W, 9/21	L12. Surface water quality: lake eutrophication and acidification.		*Project proposal*
F, 9/23 Dr. Adamson	L13. Groundwater and contaminant hydrogeology. *Start hw#6: 5.40, 5.42, 5.43, and 5.44* (40 points)	229-266	HW5 Due
M, 9/26 Dr. Adamson	L14. Groundwater and contaminant hydrogeology (continued). Hazardous waste regulations.		
W, 9/28	L15. Risk and exposure assessment. *Start hw#7: 4.20, 4.23, 4.24, 4.29, and 4.31* (50 points)	333-343 127-166	
F, 9/30	L16. Introduction to treatment processes, drinking water.		HW6 Due
M, 10/3	L17. Drinking water treatment processes. *Start hw#8: handout* (70 points)	281-316	
W, 10/5 Dr. Da Silva	L18. Wastewater treatment processes.	316-333	HW7 Due
F, 10/7	L19. Wastewater treatment processes (continued).		
M, 10/10	*Midterm break (NO CLASS).*		
W, 10/12	L20. Hazardous waste treatment.	343-358	HW8 Due

Date	Topic	Reading*	Homework
F, 10/14 Dr. Adamson	Review**.**		
M, 10/17	**EXAM 2 (Part II: Ch. 4, 5, and 6) 7-9PM @ Keck Hall 100**		
W, 10/19 Dr. Adamson	Solve Exam 2.		
F, 10/21 Dr. Adamson	**III. Air Pollution and Control** L21. Overview of air pollution and regulatory framework	367-379	
M, 10/24	L22. Criteria pollutants *Start hw#9: 7.2, 7.4, 7.6, 7.10, and 7.27* (50 points)	380-403	
W, 10/26 Dr. Adamson	L23. Air pollution meteorology.	438-451	
F, 10/28	*No class (work on project)*		
M, 10/31	L24. Point sources and the Gaussian plume; Indoor Air Pollution *Start hw#10: 7.29, 7.31, 7.34, 7.36, and 7.56* (50 points)	451-466 466-486	
W, 11/2	L25. Emission controls.	404-438	HW 9 Due
F, 11/4 Dr. Volz	*PowerPoint presentation and communication coaching*	536-557 574-587	
M, 11/7	L26. Global atmospheric change and the greenhouse effect. *Start hw#11: 8.10, 8.23, 8.26, 8.31, 8.39* (50 points)	501-535 566-574	
W, 11/9	L27. Global warming		HW 10 Due
F, 11/11	L28. Greenhouse gases and stratospheric ozone depletion.		
M, 11/14	L29. Industrial Ecology as a Tool for Sustainability.		
W, 11/16	Review**.** **EXAM 3 (Part III: Ch. 7 and 8) 7-9PM @ Keck Hall 100**		HW 11 Due
F, 11/18	*Solve Exam 3*		
M, 11/21	*No class. Work on Project*		
W, 11/23	*No class. THANKSGIVING RECESS*		
F, 11/25	*No class. THANKSGIVING RECESS*		
M, 11/28	Project presentations		*Paper due*
W, 11/30	Project presentations		
F, 12/2	Project presentations		

* Reading assignments are page numbers from the required textbook:
Masters G.M. and W.P. Ella. Introduction to Environmental Engineering and Science, 3rd Ed. Prentice Hall, 2007.

CEVE 310 Group project presentations will be held during the last week.
Each group will have a total of 10 minutes followed by up to 2 min Q/A.
Punctuality and adherence to the allotted time will be critical, and it will be considered in your grade. So please practice being on time.

Please show up early and make sure that your PowerPoint presentation is uploaded on the day you present before 7:45AM. We should not waste time by loading presentations in between talks.
Please refer to the attached schedule for your presentation.

You will be grading yourselves. To reward punctuality, no grading sheets will be distributed after the beginning of the first presentation. The sheets will be collected at the end of the period, and those turning in all three grading sheets (for three days) will receive extra credit equivalent to a perfect score on an additional homework set. Not much, but important if your final grade is borderline between, for example, C^+ and B^-.

For the project report, please include a one-page appendix (which does not count against the 10-page text limit) which will serve as your team report. Please clarify in this page how your team shared the effort and the role of each team member in contributing to the overall product and final report.